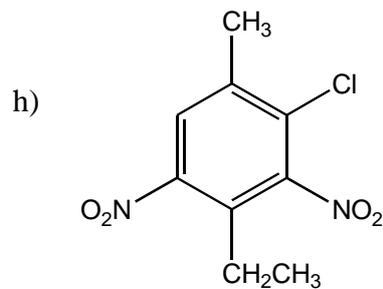
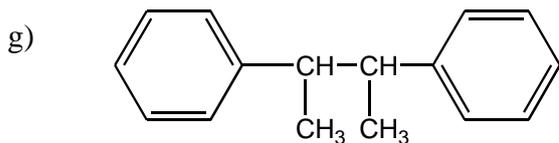
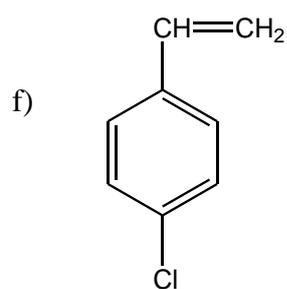
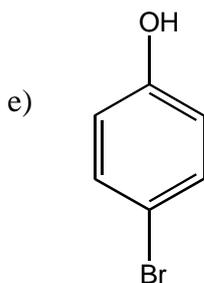
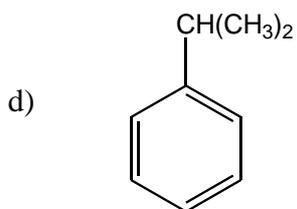
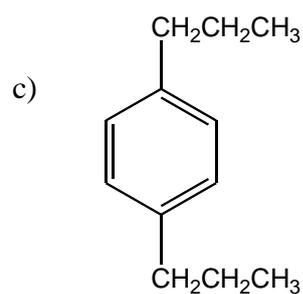
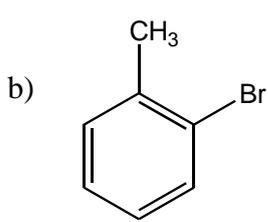
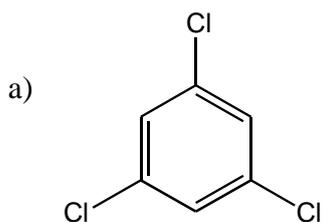
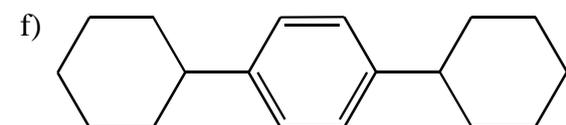
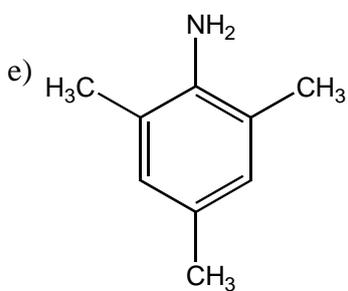
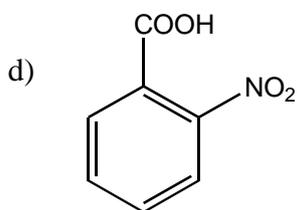
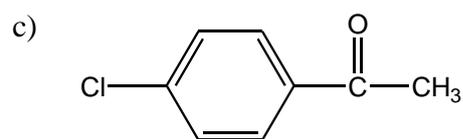
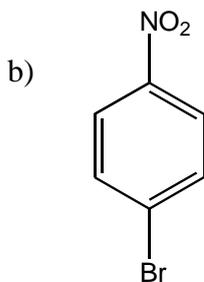
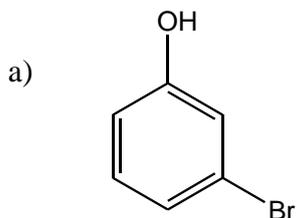


**CAPITOLO 4**

**1.**



**2.**

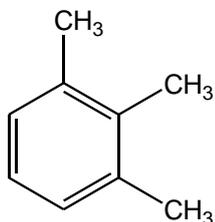


## Percorsi di chimica organica - Soluzioni degli esercizi del testo

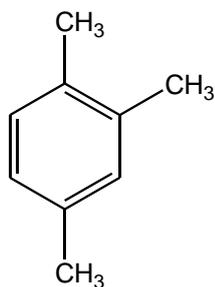
3. a) 1-fenil-4-metilpentano    b) acido *o*-bromobenzoico    c) 1-bromo-3,5-dimetilbenzene

d) 1-bromo-2-propilbenzene

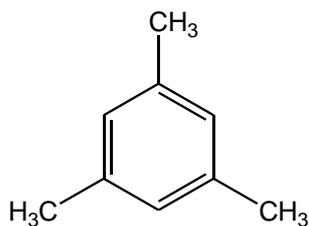
4. a)



1,2,3-trimetilbenzene

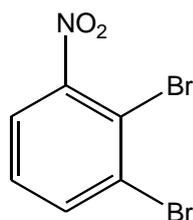


1,2,4-trimetilbenzene

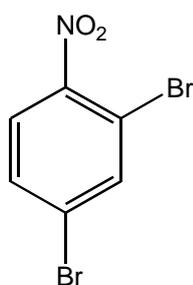


1,3,5-trimetilbenzene

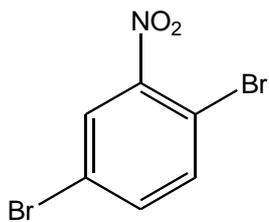
b)



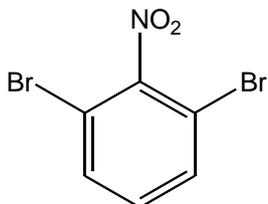
1,2-dibromo-3-nitrobenzene



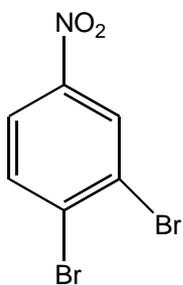
2,4-dibromo-1-nitrobenzene



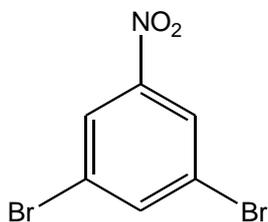
1,4-dibromo-2-nitrobenzene



1,3-dibromo-2-nitrobenzene

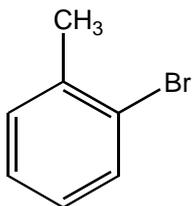


1,2-dibromo-4-nitrobenzene

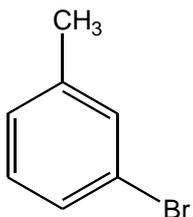


1,3-dibromo-5-nitrobenzene

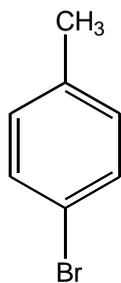
5.



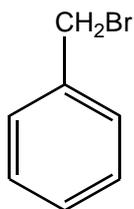
1-bromo-2-metilbenzene (*o*-bromotoluene)



1-bromo-3-metilbenzene (*m*-bromotoluene)

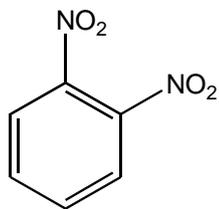


1-bromo-4-metiltoluene

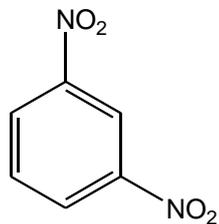


1-(bromometil)benzene

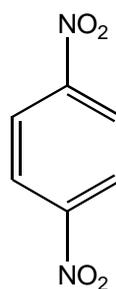
6. a)



1,2-dinitrobenzene (*o*-dinitrobenzene)

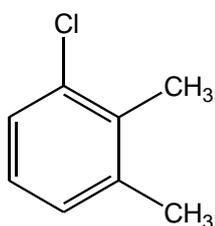


1,3-dinitrobenzene (*m*-dinitrobenzene)



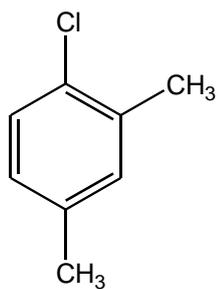
1,4-dinitrobenzene (*p*-dinitrobenzene)

b)

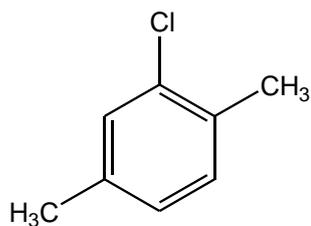


1-cloro-2,3-dimetilbenzene

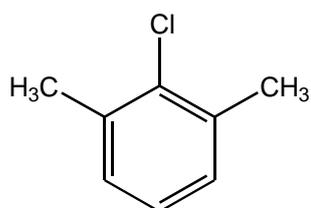
Percorsi di chimica organica - Soluzioni degli esercizi del testo



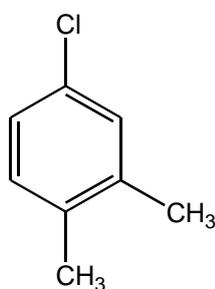
1-cloro-2,4-dimetilbenzene



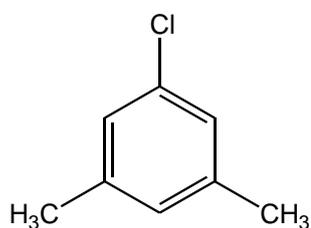
2-cloro-1,4-dimetilbenzene



2-cloro-1,3-dimetilbenzene

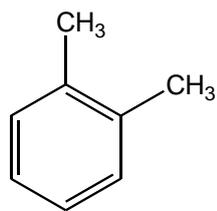


4-cloro-1,2-dimetilbenzene

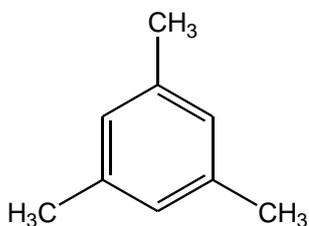


1-cloro-3,5-dimetilbenzene

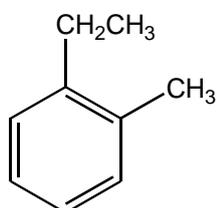
7. a)



*o*-xilene (1,2-dimetilbenzene)

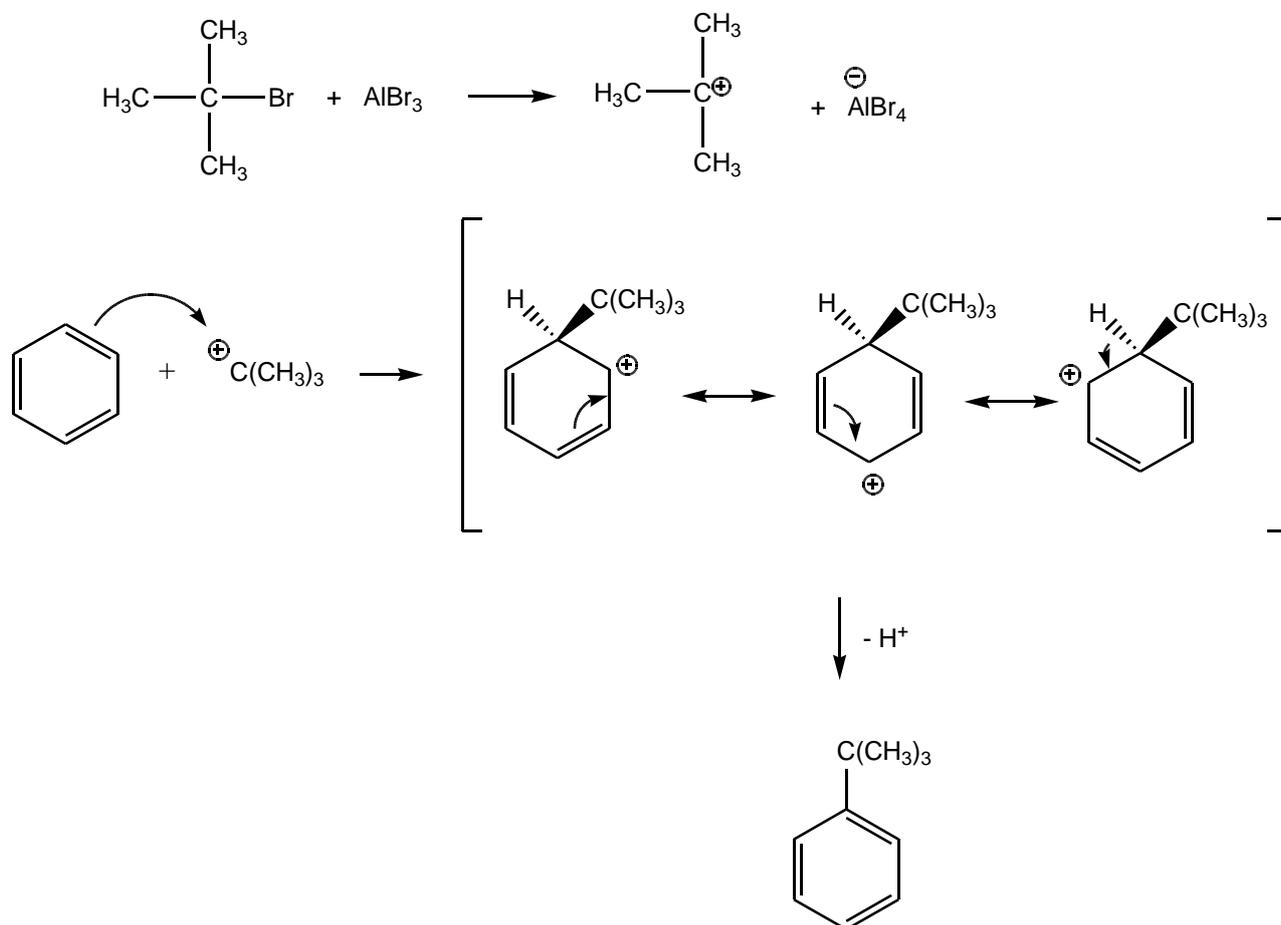


mesitilene (1,3,5-trimetilbenzene)

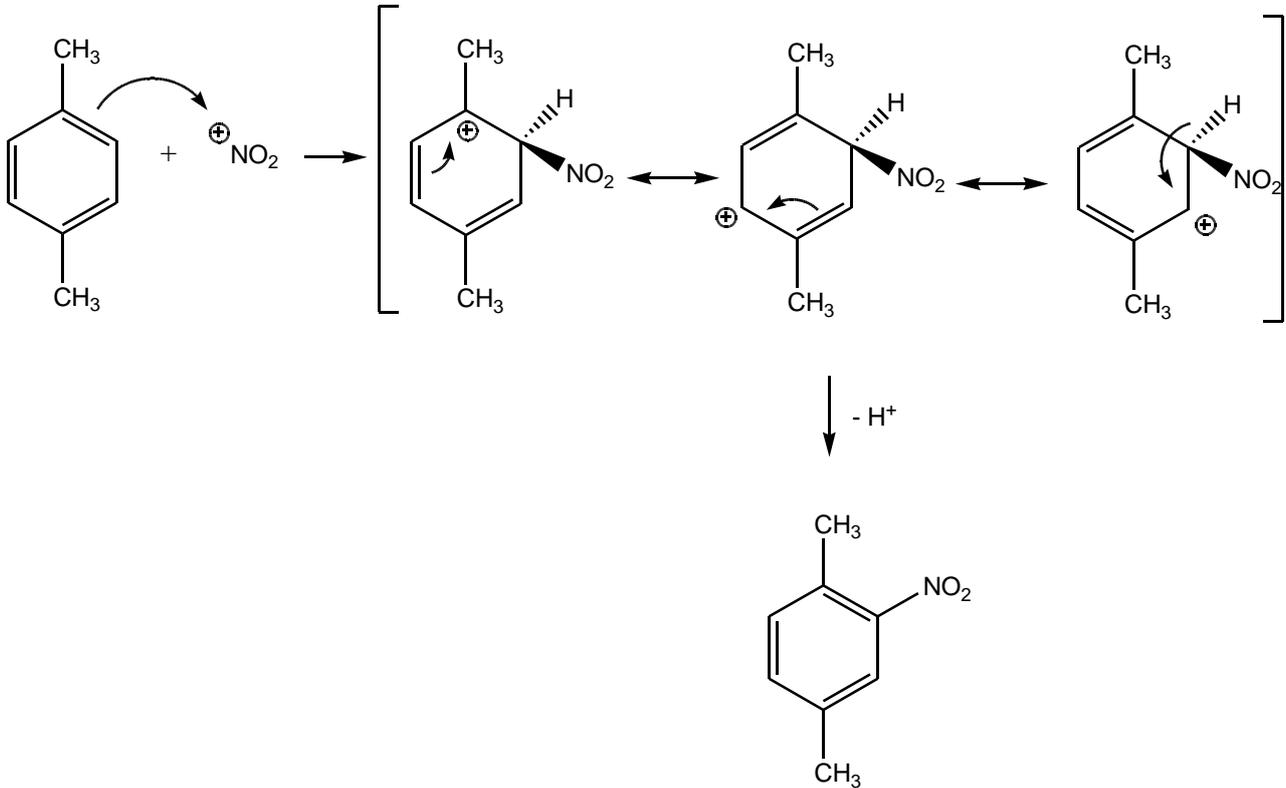
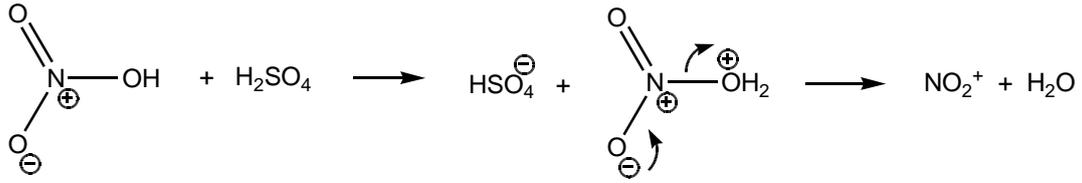


1-etil-2-metilbenzene

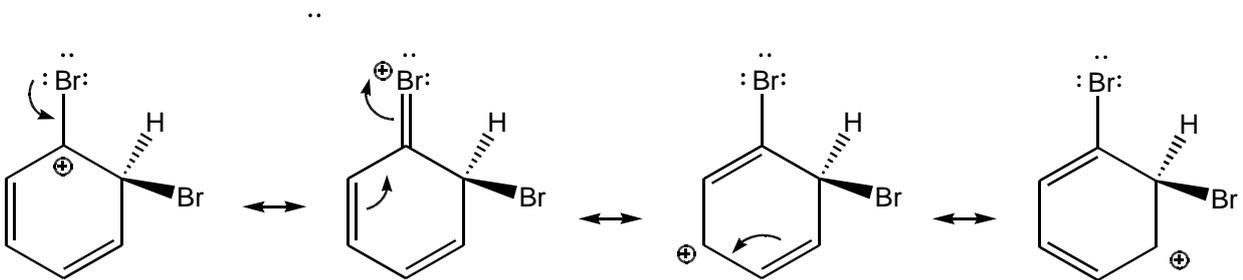
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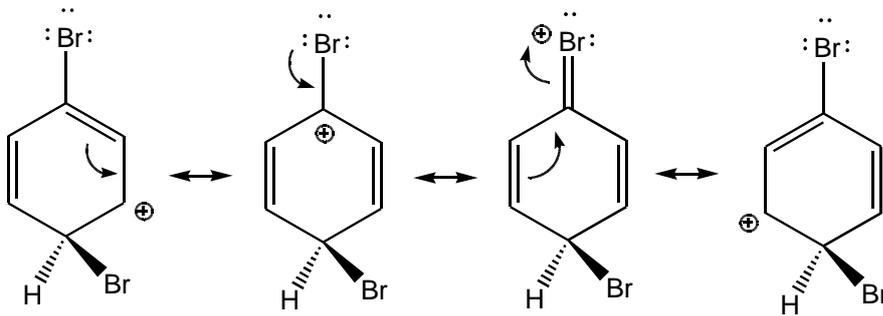
9.



10. attacco in orto:

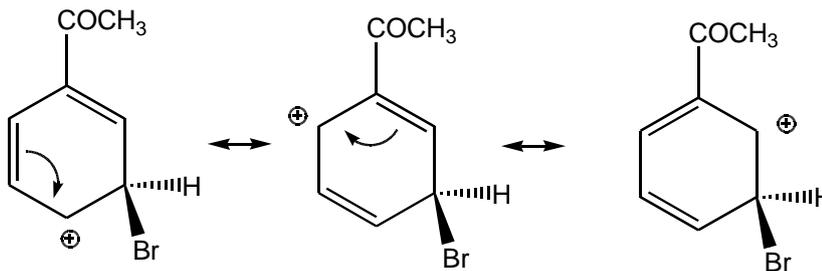


**attacco in para:**



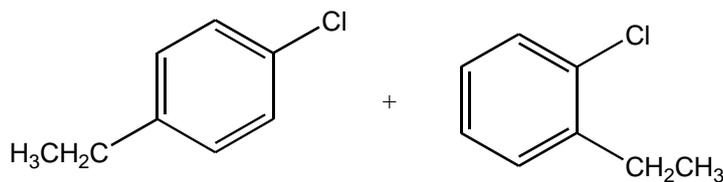
L'attacco è favorito in orto e in para perché la carica positiva finisce sul carbonio legato al bromo e il bromo cede una coppia di elettroni non condivisi permettendo la delocalizzazione ulteriore della carica positiva sul bromo stesso.

**11.**

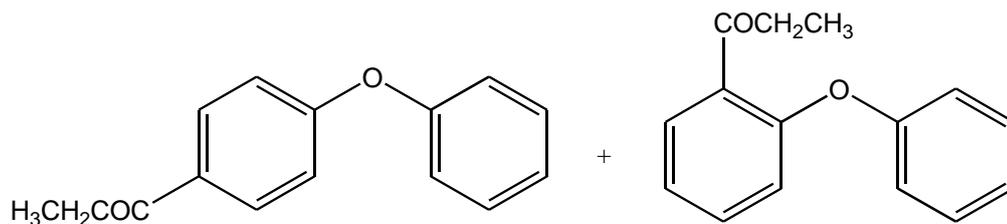


Il gruppo  $-\text{COCH}_3$  è elettrone-attrattore e destabilizza cariche positive adiacenti. L'attacco in meta è favorito perché nel carbocatione intermedio nessuna delle forme di risonanza porta la carica positiva sul carbonio legato al gruppo  $-\text{COCH}_3$ .

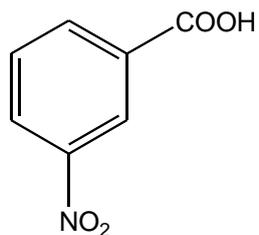
**12. a)**



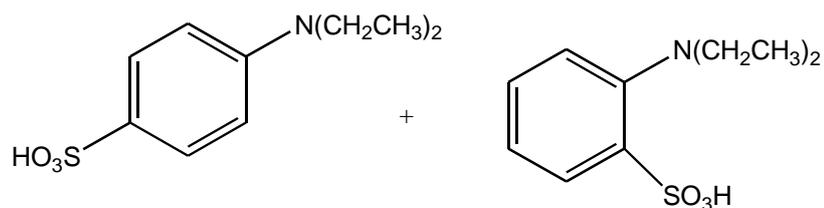
b)



c)



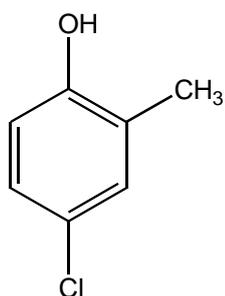
d)



13. a) *o*-dibromobenzene, bromo benzene, benzene  
 b) nitrobenzene, *p*-cloronitrobenzene, fenolo  
 c) benzaldeide, clorobenzene, *o*-xilene

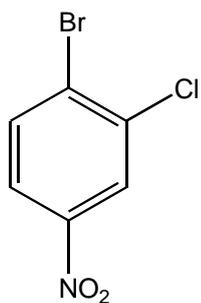
14. a) meta-orientante, disattivante  
 b) meta-orientante, disattivante  
 c) orto,para-orientante, attivante  
 d) orto,para-orientante, attivante

15. a)



**4-cloro-2-metilfenolo**

b)



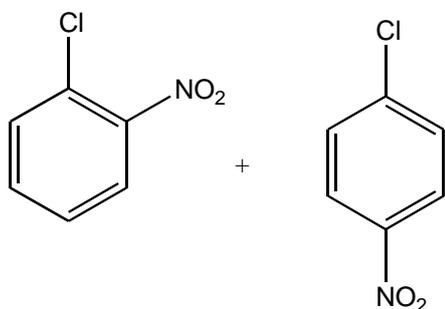
**1-bromo-2-cloro-4-nitrobenzene**

16. toluene, *p*-clorotoluene, clorobenzene, nitrobenzene.

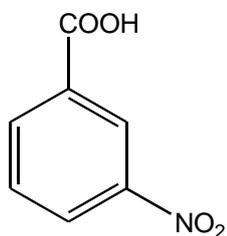
Il nitrobenzene reagisce troppo lentamente

17.

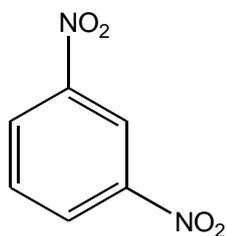
a)



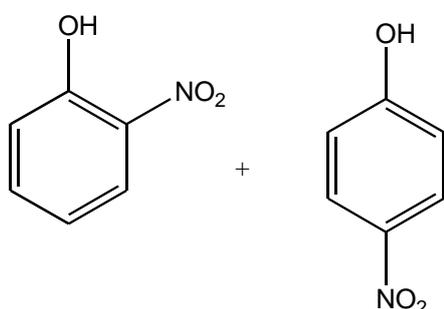
b)

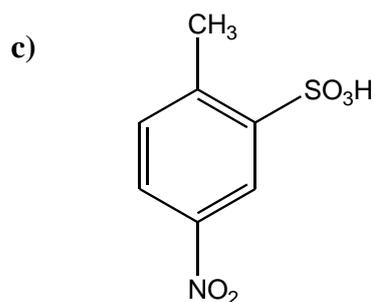
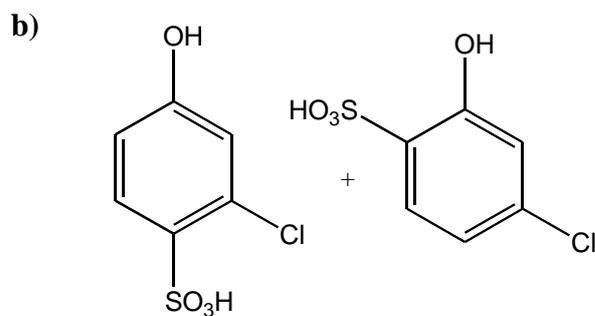
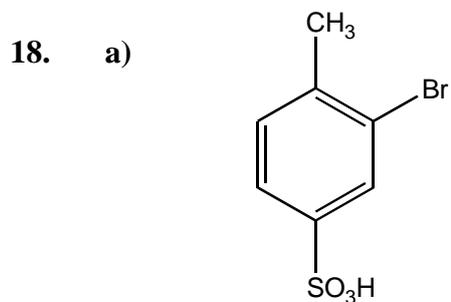
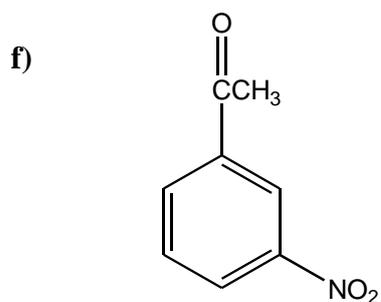
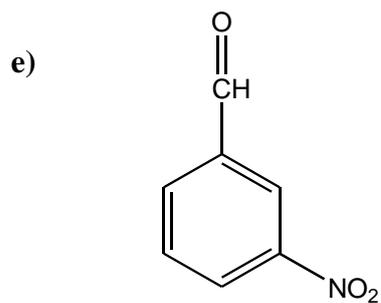


c)

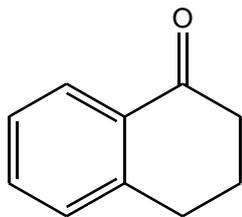


d)



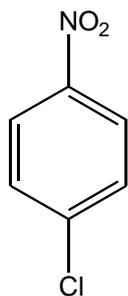


19.

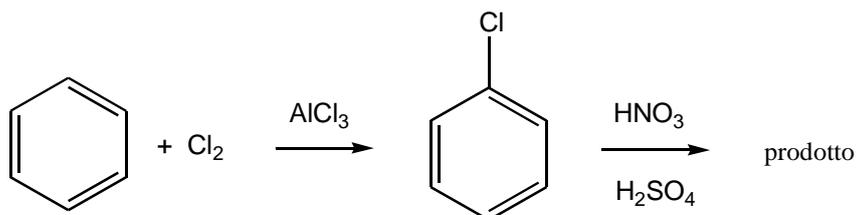


20. Perché ogni nitro gruppo introdotto rallenta la successiva reazione di sostituzione elettrofila aromatica.

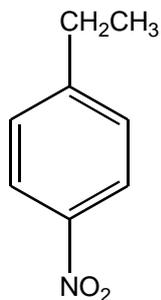
21. a)



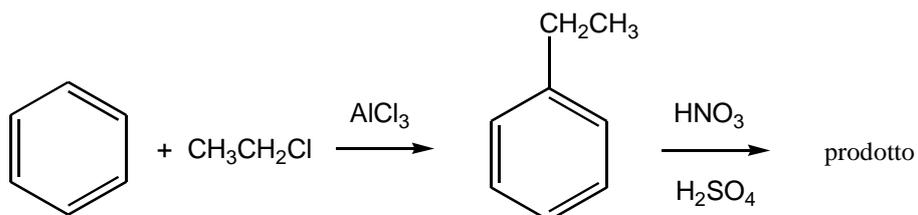
sintesi:

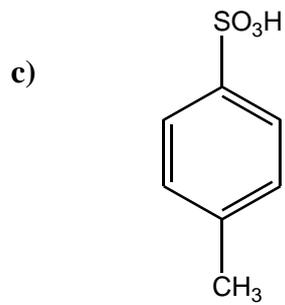


b)

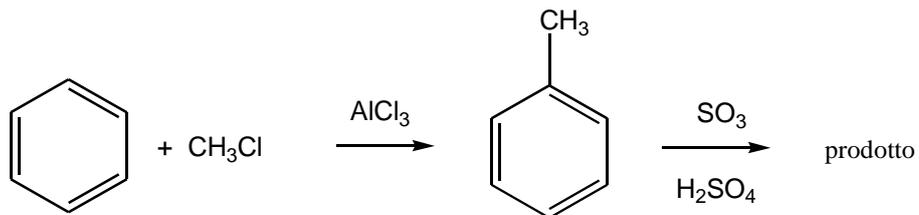


sintesi:



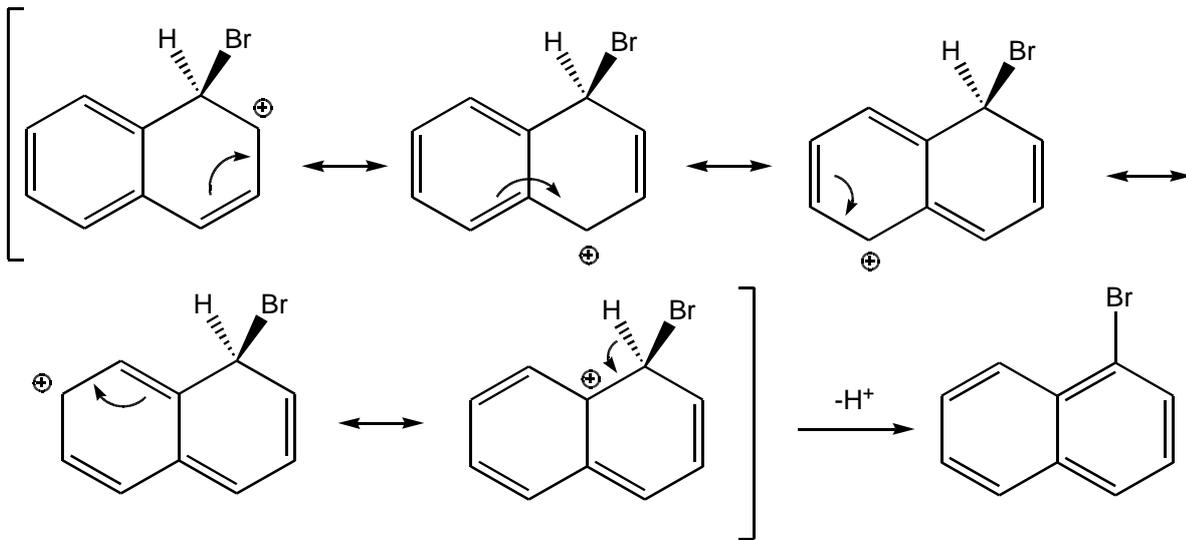


**sintesi:**

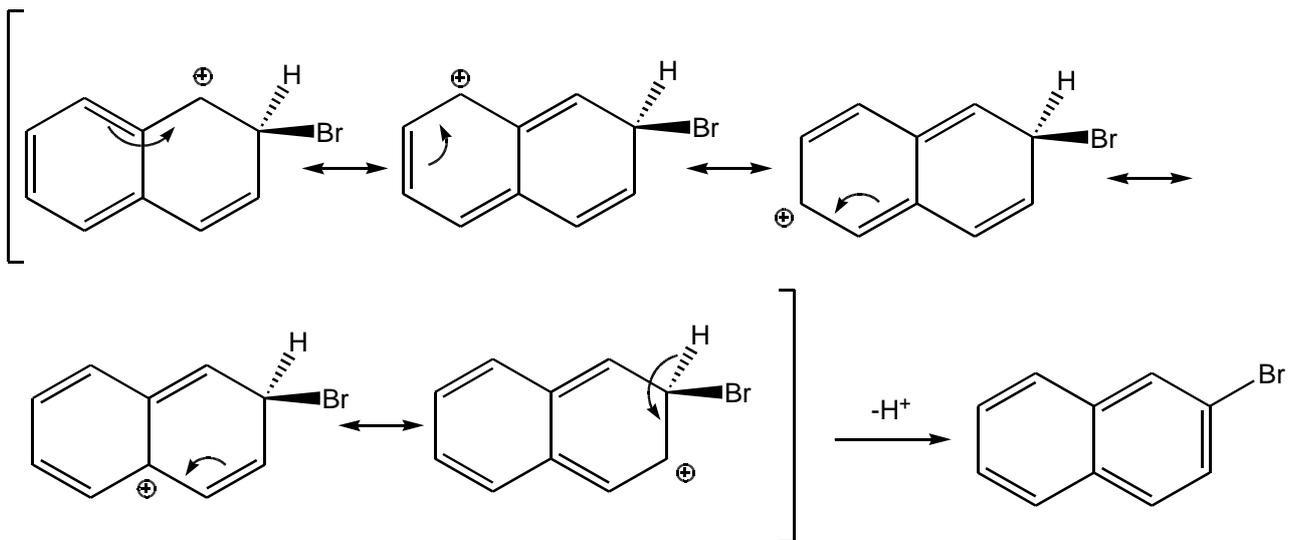




23. attacco in 1:



attacco in 2:



In entrambi i casi l'intermedio è stabilizzato da cinque forme di risonanza ma quando l'attacco avviene sul C1 due forme di risonanza conservano l'anello benzenico inalterato e contribuiscono maggiormente all'ibrido di risonanza. Se l'attacco avviene sul C2 solo una forma di risonanza conserva l'anello benzenico inalterato.